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Program looks for genetic markers of cancer

Christiana Care's Helen F. Graham Cancer Center will send tumor samples to The Cancer Genome Atlas through 2014

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Pathologist Mary Iacocca uses a scalpel to examine a tissue sample for the Christiana Care Tissue Procurement Center, which participates in The Cancer Genome Atlas project.

By KELLY BOTHUM The News Journal

One day in the future, cancer patients may be able to get treatment tailored to their genetic makeup. Those who have an increased risk of developing the disease may be able to avoid it entirely with specialized medicines.

But to do that, scientists must thoroughly understand how the many types of cancer change the body, particularly at molecular level.

That's the purpose of The Cancer Genome Atlas, a multiyear project of the National Cancer Institute and National Human Genome Research Institute that aims to uncover the genomic changes that occur in different types of cancer in order to diagnose and

treat them. Locally, Christiana Care's Helen F. Graham Cancer Center is helping that effort by collecting tumor tissue specimens from select cancer patients for genetic profiling.

The cancer center sent its first samples to The Cancer Genome Atlas about six weeks ago, said Dr. Nicholas Petrelli, medical director of the Graham Cancer Center. The 63 specimens – taken from tumors and with the consent of patients – included 20 lung cancers, 18 colon cancers, 12 ovarian tumors, seven rectal cancers, five primary brain tumors and one breast cancer. The center expects to send more than 600 samples by the time the project ends in 2014.

Researchers hope to learn about the changes that occur in a cell's RNA and DNA – its genetic material – that cause cancer growth and also to identify potential diagnostic and therapeutic markers, said Dr. Joseph Vockley, program director for The Cancer Genome or TCGA.

Cancer occurs because of problems with a cell's genome that lead to uncontrolled cell growth. The hope is that The Cancer Genome Atlas project will identify the problems in the genetic material of each cancer.

In addition, the information will be available in public databases, allowing scientists and researchers from around the world to work on improvements for diagnosing cancer and developing new drugs to treat or prevent the disease.

Christiana Care's cancer center, which received a $4.6 million grant from the National Institutes of Health last year for the project, is one of two community cancer programs participating in tissue collection for TCGA. Catholic Health Initiatives, a health system operating in 19 states, is the other.

Vockley said community cancer centers play a valuable role in getting specimen samples because they see the majority of cancer patients in the country. But not every cancer patient will be part of TCGA because of strict protocols and guidelines for procuring tissue samples. Petrelli said the project has specific criteria related to the amount of tissue taken and types of cells needed.

"The samples that Christiana provides, as well as the other tissue source sites, go into making up a diverse group of samples that are representative of the incidences of cancer in the country," Vockley said. "Without the tissues, the project couldn't go forward."

Pilot expanded

TCGA was launched as a pilot in 2006 to look at the molecular changes that occur in certain brain, ovarian and lung cancers. These cancers were selected in part because patients typically diagnosed with these tumors have a poor prognosis.

Scientists compared patient tumor samples against non-cancerous cells in the body. Although individual genes may cause cancer, most cancers are the result of multiple changes in the genome, which is made up of all the DNA in your cells. Those changes are what interest researchers the most.

“You look at the total sum of what’s going wrong in the cell,” Vockley said. “For example, the number of chromosomes in a cancer cell may now be wrong, or they may have the right number [of chromosomes] but different copies of a gene, or there’s a pathway shutdown, which causes changes in the biochemistry of the cell.”

One success of the pilot TCGA was the development of genomic characteristics for glioblastoma, the most common primary brain tumor in adults. Based on this kind of success, TCGA was expanded for five more years to look at more than 20 types of cancer. In October, President Barack Obama announced that NIH will spend $275 million on the second phase of the project.

Plenty of volunteers

Collecting tissue samples isn’t a challenge for the center, which sees about 3,000 newly diagnosed cases a year. It has been collecting tumor samples since 2003, when it opened a tissue procurement center. Specimens used for research by the Center for Translational Cancer Research, which includes Christiana Care, the University of Delaware and Alfred I. duPont Hospital for Children.

Petrelli said more than 90 percent of patients who qualify participation in the genome study have been willing to participate, making it easier to collect samples that meet the project criteria.

“They know they will be part of a legacy that will help patients in the future,” he said.

Dr. Albert Rizzo, a Newark pulmonologist, said the work being done by TCGA has the potential to reduce cancer deaths through early prevention and better treatment. If researchers can develop some kind of early warning system as a result of uncovering the genomic characteristics of lung cancer, those few patients who are at higher risk of developing the disease could be more closely monitored rather than relying on unnecessary screenings of a larger part of the population.

Advances in the genome project also could help determine the kind of radiation and chemotherapy treatments a lung cancer patient would best respond to, said Rizzo, a volunteer for the American Lung Association of the Mid-Atlantic for more than 20 years. Right now, two patients with the same kind of cancer can respond differently to the same treatment.

Research can only bring about more helpful information regarding the care and treatment of people living with cancer, said Vicky Tosh-Morelli, administrative program manager for the Delaware Breast Cancer Coalition. The organization supports research efforts at the Graham Cancer Center – as well as other hospitals in Delaware –

through its clinical trial peer mentoring program, which helps women with breast cancer understand and navigate clinical trials.

“Understanding different tumor types at the genetic level will not only allow medical professionals to target treatment for different types of breast cancer,” Tosh-Morelli said in an email, “but will also help them to better understand which cancers are more aggressive, more likely to spread or recur – or even if some are likely [to] remain relatively benign and require less aggressive treatment.”

It is this kind of potential that makes The Cancer Genome Atlas so significant. “It’s a project that’s leading us to personalized medicine,” Petrelli said.

ABOUT THE PROJECT

Here’s how The Cancer Genome Atlas Project works:

- Eligible patients are asked to donate a small portion of tumor tissue that has been removed as part of their cancer treatment. The collection does not affect a patient’s medical care.
- Scientists analyze the genetic material obtained from the tissue. The genetic information is publicly available for scientists conducting research, but any
- identifying data – such as a patient’s name or date of birth – are excluded.
- Because cancer is not a single disease, but rather a collection of diseases from different combinations of genetic changes, scientists analyze the genetic
- material from multiple tumors and patients to uncover the genetic signatures of different cancer types.
- To learn more, visit http://cancergenome.nih.gov

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